In the Claims:

1. - 7. Cancelled

8. (Previously Presented) In a method of affecting cleaning to remove AlF_3 residue from walls of a reactor chamber, the method comprising the steps of:

a) identifying cleaning process conditions of plasma containing H_2-gases that maximize H-atom concentration in said plasma of a gas mixture containing H_2 and Ar using optical emission spectroscopy or actinometry to identify the H atom concentration in the plasma based on the relative emission intensity from excited H and Ar atoms by the formula:

$$\frac{\text{intensity of H}}{\text{intensity of Ar}} \sim \text{H atom concentration;}$$

said cleaning process conditions including one or more of flow rate, pressure, and RF power;

b) subjecting said reactor chamber in situ to a gas mixture of He/H_2 for striking a plasma then subjecting said reactor chamber in situ to H_2 gas according to the cleaning process conditions identified in step a) without opening said chamber and without shutting down said chamber to affect reduction and removal of said AlF_3 residue.

9. Cancelled

10. (Previously Presented) A method of cleaning a chamber, the method comprising:

determining cleaning process conditions that maximize H atom concentration in the chamber, the cleaning process conditions including one or more of flow rate, pressure, and RF power;

injecting into the chamber a first gas mixture in accordance with striking process conditions, the first gas mixture comprising hydrogen and a first carrier gas;

striking a first plasma from the first gas mixture; and

injecting into the chamber a second gas mixture in accordance with the cleaning process conditions, wherein the second gas mixture comprises hydrogen,

wherein the cleaning process conditions are different than the striking process conditions.

11. Cancelled

12. (Previously Presented) The method of claim 10, wherein the step of striking the first plasma is performed at a flow rate of about 1,000/200 sccm, at a pressure of about 0.8 Torr, and at an RF power of about 750 W for about 5 seconds.

13. (Previously Presented) The method of claim 10, wherein the chamber remains closed.

14. (Previously Presented) The method of claim 10, wherein the determining cleaning process conditions comprises determining the flow rate to be about 500 sccm, the RF power to be about 500 W, and the pressure to be about 0.5 Torr.

15. (Previously Presented) The method of claim 10, wherein the step of determining cleaning process conditions is performed by using optical emission spectroscopy with an Ar tracer to determine the H atom concentration, the H atom concentration being determined by the formula:

$$\frac{\text{intensity of H}}{\text{intensity of Ar}} \sim \text{H atom concentration.}$$

16. (Previously Presented) The method of claim 10, wherein the first gas mixture comprises a mixture of He and H_2.

17. Cancelled

18. (Previously Presented) The method of claim 8, wherein the striking the plasma is performed at a flow rate of about 1,000/200 sccm, at a pressure of about 0.8 Torr, and at an RF power of about 750 W for about 5 seconds.

19. (Previously Presented) The method of claim 8, wherein the cleaning process conditions are determined to be a flow rate of about 500 sccm, an RF power of about 500 W, and a pressure of about 0.5 Torr.

20. (Previously Presented) A method of cleaning a chamber, the method comprising:

determining cleaning process conditions for hydrogen atoms in the chamber, the cleaning process conditions including one or more of flow rate, pressure, and RF power;

injecting into the chamber a hydrogen-containing gas mixture;

striking a plasma from the hydrogen-containing gas mixture; and

injecting hydrogen into the chamber in accordance with the cleaning process conditions.

21. (Previously Presented) The method of claim 20, wherein the step of striking the plasma is performed at a flow rate of about 1,000/200 sccm, at a pressure of about 0.8 Torr, and at an RF power of about 750 W for about 5 seconds.

22. (Previously Presented) The method of claim 20, wherein the chamber remains closed.

23. (Previously Presented) The method of claim 20, wherein the cleaning process conditions are determined to be a flow rate of about 500 sccm, an RF power of about 500 W, and a pressure of about 0.5 Torr.

24. (Previously Presented) The method of claim 20, wherein the step of determining cleaning process conditions is performed by using optical emission spectroscopy with an Ar tracer to determine the H atom concentration, the H atom concentration being determined by the formula:

$$\frac{\text{intensity of H}}{\text{intensity of Ar}} \sim \text{H atom concentration.}$$

25. (Previously Presented) The method of claim 20, wherein the hydrogen-containing gas mixture comprises a mixture of helium and hydrogen.